

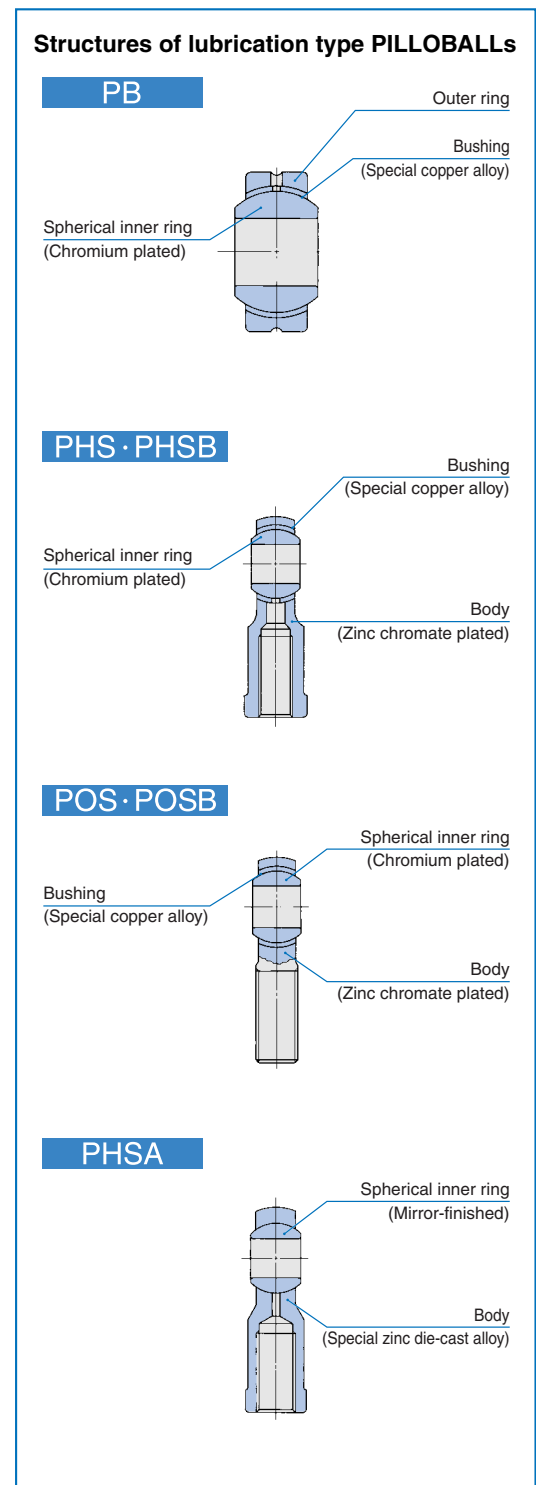
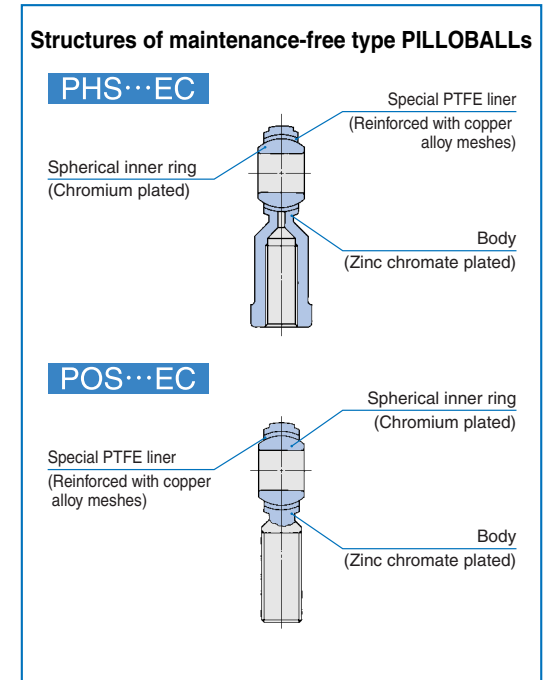
# PILLOBALLS

- PILLOBALL Spherical Bushings - Insert Type
- PILLOBALL Rod Ends - Insert Type
- PILLOBALL Rod Ends - Die-cast Type
- PILLOBALL Rod Ends - Maintenance-free Type



## Structure and Features

IKO PILLOBALLs are compact self-aligning spherical bushings that can support a large radial load and a bi-directional axial load at the same time. These bushings are classified by sliding surface types, namely, insert type, die-cast type and maintenance-free type. In the insert type, a spherical inner ring makes contact with the special copper alloy bushing with superior run-in properties. In the die-cast type, a spherical inner ring makes direct contact with the bore surface of the body of special zinc die-cast alloy. In the maintenance-free type, a spherical inner ring makes contact with the special PTFE liner of maintenance-free type. Thus, a smooth rotational and oscillatory motion can be achieved with superior anti-wear and loading properties in each type. PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, and they can be easily assembled onto machines. PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc. The maintenance-free type is especially suitable for loading in one direction and is the best choice for machines in which oil must be avoided such as food processing machines, or machines which cannot be re-lubricated.



K  
PB  
PHS  
PHSB  
POS  
POSB  
PHSA

Types

In PILLOBALLs, the types shown in Table 1 are available.

Table 1 Type

Type	Lubrication type				Maintenance-free type	
	Spherical Bushings	Rod end		Rod end		
		female thread	male thread	female thread	male thread	
Insert type	PB	PHS·PHSB	POS·POSB	PHS···EC	POS···EC	
Die-cast type	—	PHSA	—			

Lubrication Type PILLOBALL Spherical Bushings Insert Type PB

This type has superior anti-wear properties and high rigidity. It consists of a spherical inner ring, an outer ring, and a bushing of special copper alloy with superior run-in properties inserted in between. The spherical surface of the inner ring is chromium plated after heat treatment and grinding. This type is assembled with a shaft and a housing.

When especially large radial and/or axial loads are applied, Spherical Bushings with molybdenum disulfide (MoS<sub>2</sub>) treated inner and outer rings are recommended. (See page K1.)

Lubrication Type PILLOBALL Rod Ends Insert Type PHS, POS, PHSB and POSB

This type has superior anti-wear and anti-corrosion properties as well as high rigidity. It consists of a spherical inner ring of which spherical surface is chromium-plated after heat treatment and grinding, a body with a zinc chromate treated outer surface, and an inserted bushing of special copper alloy having superior run-in properties. This type includes PHS and PHSB, which has a female thread in the body, and POS and POSB, which has a male thread on the body.

Lubrication Type PILLOBALL Rod Ends Die-cast Type PHSA

The spherical inner ring of this type is mirror-finished after heat treatment and is built in a body of special zinc die-cast alloy. The sliding surfaces of the inner ring and body are in close contact with each other. Thus, this type is an economical rod end with superior anti-wear and loading properties.

Maintenance-free Type PILLOBALL Rod Ends PHS···EC, POS···EC

This type has superior anti-corrosion properties as the body is zinc chromate treated and the spherical inner

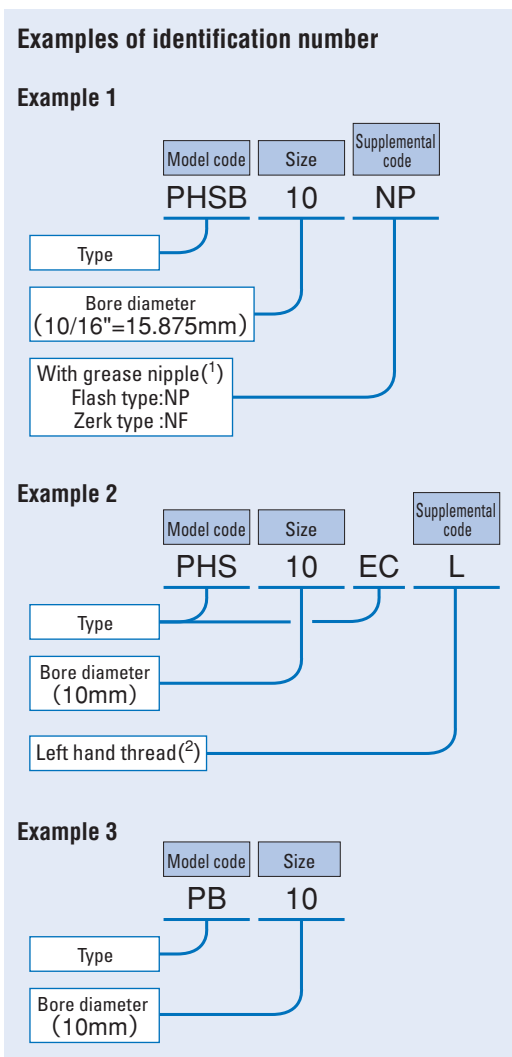
ring is chromium plated on the sphere surface after heat treatment and grinding.

A special PTFE liner, reinforced with copper alloy meshes, which is superior in anti-wear properties with little creep deformation is used for lining on the sliding surface of the body, and this type is maintenance-free.

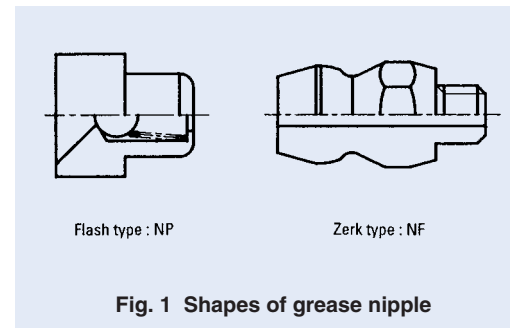
PHS···EC, which has a female thread in the body, and POS···EC, which has a male thread on the body, are available.

Identification number

The identification number of PILLOBALLs consists of a model code, a size and any supplemental codes as shown in the examples.



Notes<sup>(1)</sup> Shapes of grease nipple are shown in Fig.1. In case of no indication of grease nipple type, grease nipple is not prepared.  
<sup>(2)</sup> Right hand thread is indicated with no code.



Accuracy

The accuracy of PILLOBALLs is shown in Tables 2 and 3. The maximum radial internal clearance of the insert type is 0.035 mm.

Table 2 Tolerance

Type	Dimension	Dimension symbol	Tolerance
PB	Bore dia. of inner ring	<i>d</i>	H7
	Outside dia. of outer ring	<i>D</i>	h6
	Width of inner ring	<i>B</i>	0 -0.1
	Width of outer ring	<i>C</i>	±0.1
PHS POS PHS···EC POS···EC	Bore dia. of inner ring	<i>d</i>	H7
	Width of inner ring	<i>B</i>	0 -0.1
PHSB POSB	Bore dia. of inner ring	<i>d</i>	+0.038 -0.013
	Width of inner ring	<i>B</i> <sub>1</sub>	0 -0.127
PHSA	Bore dia. of inner ring	<i>d</i>	+0.063 -0.012
	Width of inner ring	<i>B</i>	See Table 3.

Table 3 Tolerance of width *B* of inner ring of PHSA type

Nominal bore dia. of inner ring	$\Delta_{Bs}$			
	Over	Incl.	High	Low
—	14	0	—0.2	
14	20	0	—0.3	
20	22	0	—0.4	

Fit

Recommended fits for PILLOBALLs are shown in Table 4.

Table 4 Recommended fits

Condition	Tolerance class	
	Shaft	Housing bore <sup>(1)</sup>
Normal operation	h7	H7
Directionally indeterminate loading	n6, p6	N7

Note<sup>(1)</sup> This is applicable to PILLOBALL Spherical Bushings, Insert type.

Selection of PILLOBALL

Load capacities of PILLOBALLs are determined based on the allowable contact pressure on sliding surfaces and the strength of body for each type. Thus, a suitable type and size should be selected based on the dynamic load capacity *C<sub>d</sub>* and static load capacity *C<sub>s</sub>* shown in the dimension tables.

Load capacity

① Dynamic load capacity

The dynamic load capacity *C<sub>d</sub>* is obtained on the basis of the contact pressure on the sliding surface. The dynamic load capacity is used for calculating the life.

The dynamic load capacity considering temperature increase is obtained from the following equation using the temperature factor, which is a correction factor for the effect of PILLOBALL temperature.

$$C_{dt} = f_t C_d \dots\dots\dots(1)$$

where, *C<sub>dt</sub>*: Dynamic load capacity considering temperature increase, N

*f<sub>t</sub>*: Temperature factor (Refer to Table 5.)

*C<sub>d</sub>*: Dynamic load capacity, N (Refer to the dimension tables.)

Table 5 Temperature factor *f<sub>t</sub>*

Type	Temperature °C					
	-30 +80	+80 +90	+90 +100	+100 +120	+120 +150	+150 +180
PB PHS, POS PHSB, POSB	1	1	1	1	1	0.7
PHS···EC POS···EC	1	1	0.9	0.75	0.55	—

② Static load capacity

The static load capacity *C<sub>s</sub>* is the maximum static load that can be applied on the PILLOBALL without breaking the inner or outer ring of the PILLOBALL Spherical Bushing (or the inner ring or body of the PILLOBALL Rod End), and without causing severe permanent deformation that will make the PILLOBALL unusable.



**Maximum Operating Load**

The recommended value of bushing load is obtained by multiplying the dynamic load capacity  $C_d$  by a numerical factor, which differs depending on the bushing type and load condition. For PILLOBALL Rod Ends, the static load capacity  $C_s$  must also be considered in determining the applicable bushing load. Table 6 shows the guidelines for maximum operating load of PILLOBALLS. When axial loads are added in addition to radial loads, bending stress occurs in the body. Pay attention to this bending stress.

**Table 6 Maximum operating load**

Type	Load direction	
	Constant	Alternate
PB	$\leq 0.3C_d$	$\leq 0.6C_d$
PHS,POS,PHSB,POSB	$\leq 0.3C_d$	$\leq 0.2C_s$
PHSA	$\leq 0.16C_s$	
PHS...EC,POS...EC	$\leq 0.3C_s$	$\leq 0.2C_s$

Remark  $C_d$  is the dynamic load capacity and  $C_s$  is the static load capacity.

**Equivalent radial load**

PILLOBALLS can take radial and axial loads at the same time. When the magnitude and direction of loads are constant, the equivalent radial load can be obtained by the following formula.

$$P = F_r + YF_a \quad (2)$$

where,  $P$  : Equivalent radial load, N

$F_r$  : Radial load, N

$F_a$  : Axial load, N

$Y$  : Axial load factor (Refer to Table 7.)

**Table 7 Axial load factor  $Y$**

Type	$F_a/F_r$	0.1	0.2	0.3	0.4	0.5	> 0.5
PB		1	2	3	4	5	Unusable
PHS,POS PHSB,POSB		1	2	3	4	5	Unusable
PHS...EC POS...EC		1	2	3	Unusable		

**Life**

The life of PILLOBALLS is defined as the total number of oscillating motions during which the PILLOBALLS can be operated without failure or malfunction due to wear, increase in internal clearance, increase in sliding torque and operating temperature, etc.

As the actual life is affected by many factors such as the material of the sliding surface, the magnitude and direction of load, lubrication, sliding velocity, etc., the calculated life can be used as a measure of expected service life.

**① Life of lubrication type PILLOBALLS  
PB · PHS · POS · PHSB · POSB**

**[1] Confirmation of  $pV$  value**

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the  $pV$  diagram in Fig.2.

When the operating conditions are out of the permissible range, please consult **IKO**.

The contact pressure  $p$  and the sliding velocity  $V$  are obtained from the following formulae.

$$p = \frac{50P}{C_{dt}} \quad (3)$$

$$V = 5.82 \times 10^{-4} d_k \beta f \quad (4)$$

where,  $p$  : Contact pressure, N/mm<sup>2</sup>

$P$  : Equivalent radial load, N

(Refer to Formula (2).)

$C_{dt}$  : Dynamic load capacity considering temperature increase, N

(Refer to Formula (1).)

$V$  : Sliding velocity, mm/s

$d_k$  : Sphere diameter, mm

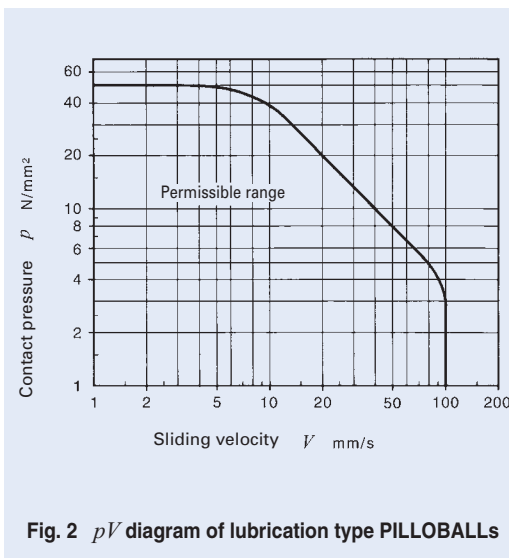
(Refer to the dimensional tables.)

$2\beta$  : Oscillating angle degrees (Refer to Fig.3.)

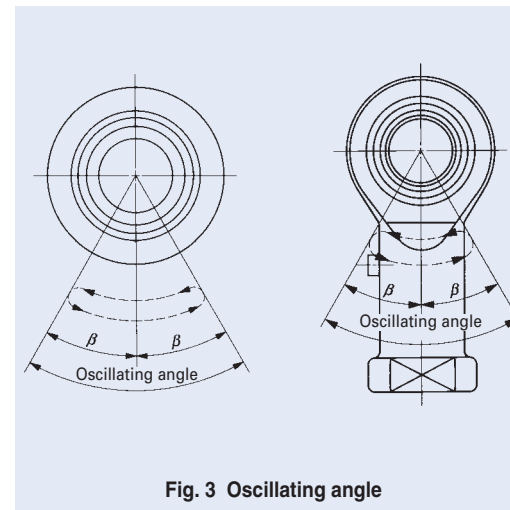
when  $\beta < 5^\circ$ ,  $\beta = 5$

when rotating,  $\beta = 90$

$f$  : Number of oscillations per minute, cpm



**Fig. 2  $pV$  diagram of lubrication type PILLOBALLS**



**Fig. 3 Oscillating angle**

**[2] Life calculation**

The life of lubrication type PILLOBALLS can be calculated by the following formulae.

$$G = \frac{3.18b_1b_2b_3}{\sqrt{d_k\beta}} \left(\frac{C_{dt}}{P}\right)^2 \times 10^5 \quad (5)$$

$$L_h = \frac{G}{60f} \quad (6)$$

where,  $G$  : Life (Total number of oscillations)

$b_1$  : Load directional factor (Refer to Table 8.)

$b_2$  : Lubrication factor (Refer to Table 8.)

$b_3$  : Sliding velocity factor (Refer to Fig. 4.)

$C_{dt}$  : Dynamic load capacity considering temperature increase, N

(Refer to Formula (1).)

$P$  : Equivalent radial load, N

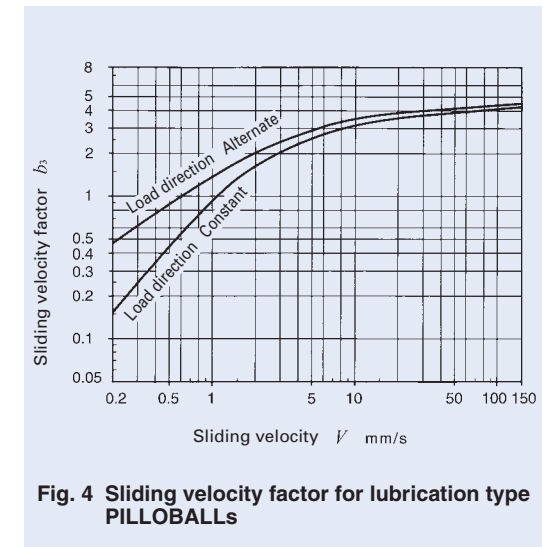
(Refer to Formula (2).)

$L_h$  : Life in hours, h

$f$  : Number of oscillations per minute, cpm

**Table 8 Load directional factor  $b_1$  and lubrication factor  $b_2$  for lubrication type PILLOBALLS**

Load directional factor $b_1$		Lubrication factor $b_2$	
Load direction		Periodical lubrication	
Constant	Alternate	None	Regular
1	5	1	15



**Fig. 4 Sliding velocity factor for lubrication type PILLOBALLS**

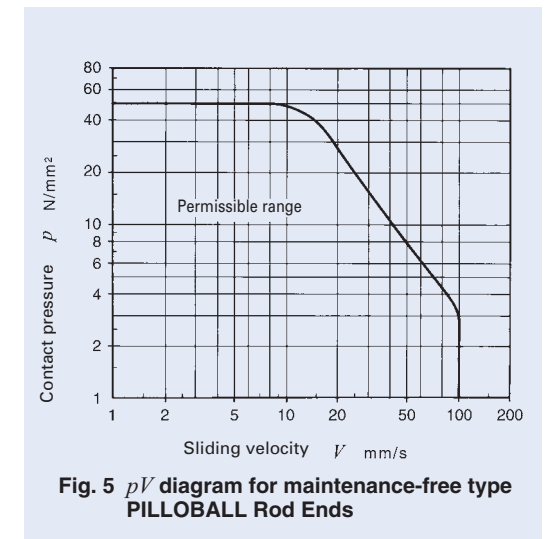
**② Life of maintenance-free type PILLOBALLS PHS...EC·POS...EC**

**[1] Confirmation of  $pV$  value**

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the  $pV$  diagram in Fig.5.

When the operating conditions are out of the permissible range, please consult **IKO**.

The contact pressure  $p$  and sliding velocity  $V$  are obtained from Formulae (3) and (4) on page K6.



**Fig. 5  $pV$  diagram for maintenance-free type PILLOBALL Rod Ends**

[2] Life calculation

The life of maintenance-free type PILLOBALL Rod Ends is obtained from the total sliding distance  $S$  which is given in Fig.5 for the contact pressure  $p$  obtained from Formula (3).

The total number of oscillations and life in hours can be obtained from the following formulae.

$$G = 16.67 \times b_1 \times \frac{Sf}{V} \dots\dots\dots(7)$$

$$L_h = \frac{G}{60f} \dots\dots\dots(8)$$

where,  $G$  : Life (Total number of oscillations)  
 $b_1$  : Load directional factor (Refer to Table 9.)  
 $S$  : Total sliding distance m  
 $f$  : Number of oscillations per minute cpm  
 $V$  : Sliding velocity mm/s  
 $L_h$  : Life in hours h

Table 9 Load directional factor for maintenance-free type PILLOBALLS  $b_1$

Load direction	Constant	Alternate
Load directional factor $b_1$	1	0.2 <sup>(1)</sup>

Note<sup>(1)</sup> This value is applicable when the load changes comparatively slowly. When the load changes rapidly, please consult **IKO**, as the factor decreases sharply.

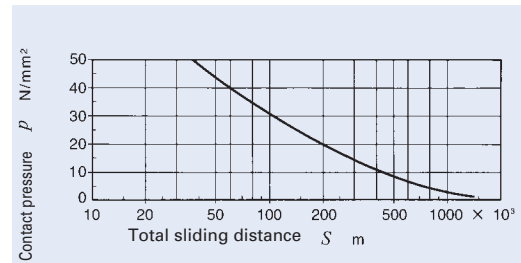


Fig. 6 Contact pressure and total sliding distance for maintenance-free type PILLOBALL Rod Ends

**Lubrication**

Maintenance-free type PILLOBALL Rod Ends have a sliding surface lined with a self-lubricating lining. Therefore, they can be used without lubrication. Lubrication type PILLOBALLS are not provided with prepacked grease. Perform proper lubrication for use. Operating without lubrication will increase the wear of the sliding contact surfaces and cause seizure.

**Oil Hole and Grease Nipple**

Table 10 shows the specifications of oil hole and grease nipple on the outer ring or body. Further, lubrication nozzle models compatible with the grease nipple are shown in Table 11.

For PILLOBALLS without an oil hole and grease nipple, apply grease directly on the spherical surface.

Table 10 Specifications of oil hole and grease nipple

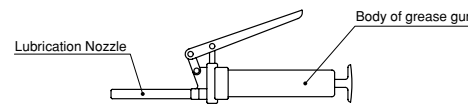
Type	Specification	
	Bore diameter of inner ring $d$ mm	
PB		1 oil hole + oil groove
PHS	$d \leq 4$	None
	$4 < d$	With grease nipple
POS	$d \leq 4$	None
	$4 < d \leq 6$	1 oil hole
	$6 < d$	With grease nipple
PHSB · POSB		None <sup>(1)</sup>
PHSA		With grease nipple
PHS ··· EC, POS ··· EC		None

Note<sup>(1)</sup> Grease Nipple is available for size 4 or larger with supplemental code.

Table 11 Types and Dimension of Lubrication Nozzles

Type	Dimension
A-5126T	
A-5120R	
B-5120R	

Remark HSP-3(Yamada Corporation) can be used for them. The above nozzles can be attached on the standard grease gun shown below.



**Operating Temperature Range**

The maximum allowable temperature for Lubrication type PILLOBALLS is +180°C for the insert type and +80°C for the die-cast type.

The maximum allowable temperature for Maintenance-free type PILLOBALL Rod Ends is +150°C.

**Precautions for Use**

1 Tightening depth

The recommended tightening depth of the screw into the PILLOBALL Rod End body is shown below.

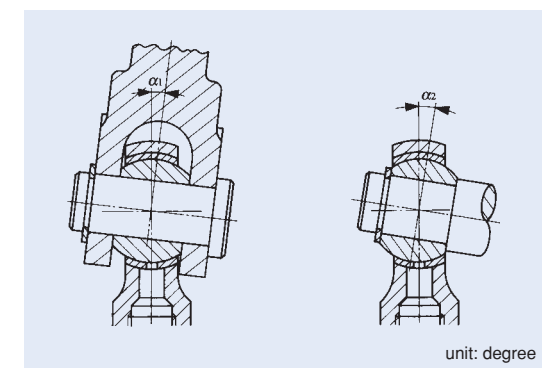
Insert type and maintenance-free type: 1.25 times the nominal thread dia. or more.

Die-cast type: 2 times the nominal thread dia. or more.

2 Allowable tilting angle

The allowable tilting angle differs depending on the mounting structure as shown in Table 12 and Table 13.

Table 12 Allowable tilting angle



unit: degree

$d$ Bore diameter mm	PB <sup>(1)</sup> , PHS, POS PHS ··· EC, POS ··· EC		PHSA	
	$\alpha_1$	$\alpha_2$	$\alpha_1$	$\alpha_2$
3	7	13	—	—
4	7	13	—	—
5	8	13	7	13
6	8	13	7	13
8	8	14	8	14
10	8	14	8	14
12	8	13	8	13
14	10	16	9	16
16	9	15	9	15
18	9	15	9	15
20	9	15	9	15
22	10	15	9	15
25	9	15	—	—
28	9	15	—	—
30	10	17	—	—

Note<sup>(1)</sup> In the case of the PB series,  $\alpha_2$  is applicable in general.

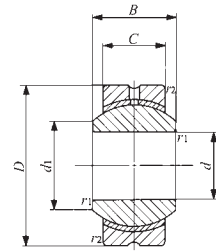
Table 13 Allowable tilting angle for inch series

unit: degree

With female thread	With male thread	$\alpha_1$	$\alpha_2$
PHSB 2	POSB 2	8	16
PHSB 2.5	POSB 2.5	7	12
PHSB 3	POSB 3	6	10
PHSB 4	POSB 4	7	13
PHSB 5	POSB 5	6	10
PHSB 6	POSB 6	6	11
PHSB 7	POSB 7	7	11
PHSB 8	POSB 8	6	9
PHSB 10	POSB 10	7	11
PHSB 12	POSB 12	6	10
PHSB 16	POSB 16	7	14

**PILLOBALL**

Lubrication Type PILLOBALL Spherical Bushings **Insert Type**

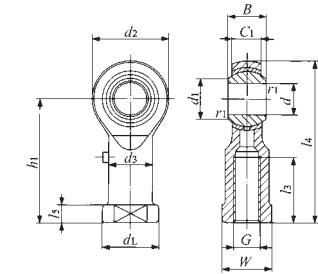


PB

Identification number	Mass (Ref.) g	Boundary dimensions mm							Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N
		$d$	$D$	$C$	$B$	$d_1$	$r_{s \min}^{(1)}$	Ball dia. mm (inch)		
<b>PB 5</b>	8.5	5	16	6	8	7.7	0.2	11.112 ( $\frac{7}{16}$ )	3 270	7 850
<b>PB 6</b>	13	6	18	6.75	9	9	0.2	12.700 ( $\frac{1}{2}$ )	4 200	10 100
<b>PB 8</b>	24	8	22	9	12	10.4	0.2	15.875 ( $\frac{5}{8}$ )	7 010	16 800
<b>PB 10</b>	39	10	26	10.5	14	12.9	0.2	19.050 ( $\frac{3}{4}$ )	9 810	23 500
<b>PB 12</b>	58	12	30	12	16	15.4	0.2	22.225 ( $\frac{7}{8}$ )	13 100	31 400
<b>PB 14</b>	84	14	34	13.5	19	16.9	0.3	25.400 (1)	16 800	40 400
<b>PB 16</b>	111	16	38	15	21	19.4	0.3	28.575 ( $1\frac{1}{8}$ )	21 000	50 400
<b>PB 18</b>	160	18	42	16.5	23	21.9	0.3	31.750 ( $1\frac{1}{4}$ )	25 700	61 600
<b>PB 20</b>	210	20	46	18	25	24.4	0.3	34.925 ( $1\frac{3}{8}$ )	30 800	74 000
<b>PB 22</b>	265	22	50	20	28	25.8	0.3	38.100 ( $1\frac{1}{2}$ )	37 400	89 700
<b>PB 25</b>	390	25	56	22	31	29.6	0.6	42.862 ( $1\frac{11}{16}$ )	46 200	111 000
<b>PB 28</b>	410	28	62	25	35	32.3	0.6	47.625 ( $1\frac{7}{8}$ )	58 400	140 000
<b>PB 30</b>	610	30	66	25	37	34.8	0.6	50.800 (2)	62 300	149 000

Note<sup>(1)</sup> Minimum allowable value of chamfer dimensions  $r_1$  and  $r_2$   
 Remarks1. The outer ring has an oil groove and an oil hole.  
 2. No grease is prepacked. Perform proper lubrication.

Lubrication Type PILLOBALL Rod Ends **Insert Type/With Female Thread**

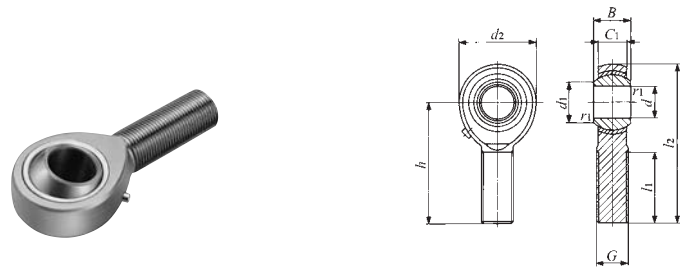


PHS

Identification number	Mass (Ref.) g	Boundary dimensions mm															Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N
		$d$	Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_4$	$h_1$	$l_3$	$l_5$	$W$	$d_3$	$d_L$	$r_{1s \min}^{(1)}$	Ball dia. mm (inch)		
<b>PHS 3</b>	5.7	3	M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 ( $\frac{5}{16}$ )	1 750	3 670
<b>PHS 4</b>	11.9	4	M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 ( $\frac{3}{8}$ )	2 480	4 680
<b>PHS 5</b>	16.5	5	M 5×0.8	16	6	8	7.7	35	27	14	4	9	9	11	0.2	11.112 ( $\frac{7}{16}$ )	3 270	5 730
<b>PHS 6</b>	25	6	M 6×1	18	6.75	9	9	39	30	14	5	11	10	13	0.2	12.700 ( $\frac{1}{2}$ )	4 200	6 910
<b>PHS 8</b>	43	8	M 8×1.25	22	9	12	10.4	47	36	17	5	14	12.5	16	0.2	15.875 ( $\frac{5}{8}$ )	7 010	10 200
<b>PHS 10</b>	72	10	M10×1.5	26	10.5	14	12.9	56	43	21	6.5	17	15	19	0.2	19.050 ( $\frac{3}{4}$ )	9 810	13 300
<b>PHS 12</b>	107	12	M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 ( $\frac{7}{8}$ )	13 100	16 900
<b>PHS 14</b>	160	14	M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	16 800	20 900
<b>PHS 16</b>	210	16	M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 ( $1\frac{1}{8}$ )	21 000	25 400
<b>PHS 18</b>	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 ( $1\frac{1}{4}$ )	25 700	30 200
<b>PHS 20</b>	380	20	M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 ( $1\frac{3}{8}$ )	30 800	35 500
<b>PHS 22</b>	490	22	M22×1.5	50	20	28	25.8	109	84	43	12	32	30	37	0.2	38.100 ( $1\frac{1}{2}$ )	37 400	41 700
<b>PHS 25</b>	750	25	M24×2	60	22	31	29.6	124	94	48	12	36	33.5	42	0.6	42.862 ( $1\frac{11}{16}$ )	46 200	72 700
<b>PHS 28</b>	950	28	M27×2	66	25	35	32.3	136	103	53	12	41	37	46	0.6	47.625 ( $1\frac{7}{8}$ )	58 400	87 000
<b>PHS 30</b>	1 130	30	M30×2	70	25	37	34.8	145	110	56	15	41	40	50	0.6	50.800 (2)	62 300	92 200

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$   
 Remarks1. Neither oil hole nor grease nipple is provided for PHS with an inner ring bore diameter  $d$  of 4 mm or less.  
 For others, a grease nipple is provided on the body.  
 2. No grease is prepacked. Perform proper lubrication.  
 3. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact **IKO**.

Lubrication Type PILLOBALL Rod Ends **Insert Type/With Male Thread**

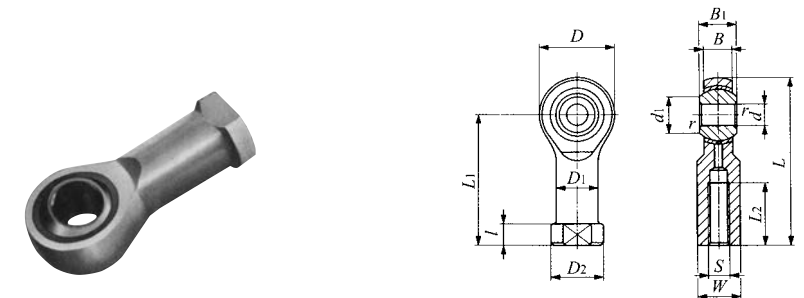


POS

Identification number	Mass (Ref.) g	Boundary dimensions mm										Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		$d$	Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_2$	$h$	$l_1$	$r_{1s\min}^{(1)}$			Ball dia. mm (inch)
POS 3	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 ( $\frac{5}{16}$ )	1 750	1 220
POS 4	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 ( $\frac{3}{8}$ )	2 480	2 060
POS 5	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 ( $\frac{7}{16}$ )	3 270	3 340
POS 6	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 ( $\frac{1}{2}$ )	4 200	4 730
POS 8	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 ( $\frac{5}{8}$ )	7 010	8 640
POS 10	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 ( $\frac{3}{4}$ )	9 810	13 300
POS 12	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 ( $\frac{7}{8}$ )	13 100	16 900
POS 14	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 (1)	16 800	20 900
POS 16	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 (1 $\frac{1}{8}$ )	21 000	25 400
POS 18	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 (1 $\frac{1}{4}$ )	25 700	30 200
POS 20	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 (1 $\frac{3}{8}$ )	30 800	35 500
POS 22	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 (1 $\frac{1}{2}$ )	37 400	41 700
POS 25	650	25	M24×2	60	22	31	29.6	124	94	57	0.6	42.862 (1 $\frac{11}{16}$ )	46 200	72 700
POS 28	875	28	M27×2	66	25	35	32.3	136	103	62	0.6	47.625 (1 $\frac{7}{8}$ )	58 400	87 000
POS 30	1 070	30	M30×2	70	25	37	34.8	145	110	66	0.6	50.800 (2)	62 300	92 200

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$   
 Remarks1. Neither oil hole nor grease nipple is provided for POS with an inner ring bore diameter  $d$  of 4 mm or less.  
 For those with an inner ring bore diameter  $d$  of 5 to 6 mm, an oil hole is provided on the body. For others, a grease nipple is provided on the body.  
 2. No grease is prepacked. Perform proper lubrication.  
 3. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact **IKO**.

Inch series PILLOBALL Rod Ends **Insert Type/With Female Thread**

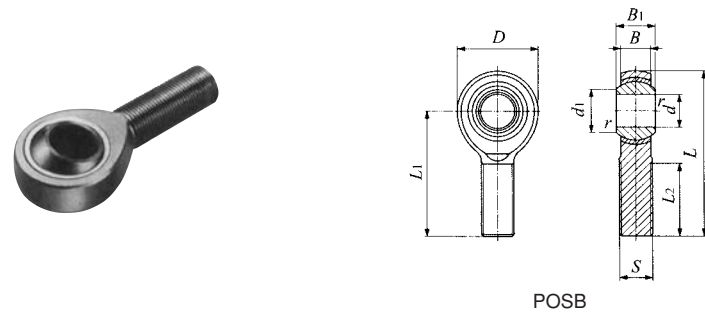


PHSB

Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)														Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		$d$	Thread $S$ class 3B	$D$	$B$	$B_1$	$d_1$	$L$	$l$	$L_1$	$L_2$	$W$	$D_1$	$D_2$	$r_{1s\min}^{(1)}$			Ball dia. mm (inch)
PHSB 2	6.8	3.175 (.1250)	-32UNC (.1380)	11.91 (.469)	4.75 (.187)	6.35 (.250)	4.75 (.187)	26.57 (1.046)	4.75 (.187)	20.62 (.812)	9.53 (.375)	6.35 (.250)	6.35 (.250)	7.92 (.312)	0.3 (.012)	7.938 ( $\frac{5}{16}$ )	1 850	5 840
PHSB 2.5	11	3.967 (.1562)	-32UNC (.1640)	14.27 (.562)	5.56 (.219)	7.14 (.281)	6.32 (.249)	29.36 (1.156)	4.75 (.187)	22.23 (.875)	9.53 (.375)	7.14 (.281)	7.14 (.281)	8.74 (.344)	0.3 (.012)	9.525 ( $\frac{3}{8}$ )	2 600	8 210
PHSB 3	14	4.826 (.1900)	-32UNF (.1900)	15.88 (.625)	6.35 (.250)	7.92 (.312)	7.77 (.306)	34.93 (1.375)	4.75 (.187)	26.97 (1.062)	14.27 (.562)	7.92 (.312)	7.92 (.312)	10.31 (.406)	0.3 (.012)	11.112 ( $\frac{7}{16}$ )	3 460	9 090
PHSB 4	23	6.350 (.2500)	-28UNF (.2500)	19.05 (.750)	7.14 (.281)	9.53 (.375)	9.02 (.355)	42.85 (1.687)	4.75 (.187)	33.32 (1.312)	19.05 (.750)	9.53 (.375)	9.53 (.375)	11.89 (.468)	0.5 (.020)	13.097 ( $\frac{33}{64}$ )	4 590	13 200
PHSB 5	36	7.938 (.3125)	-24UNF (.3125)	22.23 (.875)	8.74 (.344)	11.10 (.437)	11.35 (.447)	46.02 (1.812)	4.75 (.187)	34.93 (1.375)	19.05 (.750)	11.10 (.437)	11.10 (.437)	12.70 (.500)	0.5 (.020)	15.875 ( $\frac{5}{8}$ )	6 800	16 500
PHSB 6	59	9.525 (.3750)	-24UNF (.3750)	25.40 (1.000)	10.31 (.406)	12.70 (.500)	13.13 (.517)	53.98 (2.125)	6.35 (.250)	41.28 (1.625)	23.80 (.937)	14.27 (.562)	14.27 (.562)	17.45 (.687)	0.5 (.020)	18.256 ( $\frac{23}{32}$ )	9 230	21 600
PHSB 7	82	11.112 (.4375)	-20UNF (.4375)	28.58 (1.125)	11.10 (.437)	14.27 (.562)	14.88 (.586)	60.33 (2.375)	6.35 (.250)	46.02 (1.812)	26.97 (1.062)	15.88 (.625)	15.88 (.625)	19.05 (.750)	0.5 (.020)	20.638 ( $\frac{13}{16}$ )	11 200	26 100
PHSB 8	132	12.700 (.5000)	-20UNF (.5000)	33.32 (1.312)	12.70 (.500)	15.88 (.625)	17.73 (.698)	70.64 (2.781)	6.35 (.250)	53.98 (2.125)	30.15 (1.187)	19.05 (.750)	19.05 (.750)	22.23 (.875)	0.5 (.020)	23.812 ( $\frac{15}{16}$ )	14 800	36 200
PHSB 10	191	15.875 (.6250)	-18UNF (.6250)	38.10 (1.500)	14.27 (.562)	19.05 (.750)	21.31 (.839)	82.55 (3.250)	7.92 (.312)	63.50 (2.500)	38.10 (1.500)	22.23 (.875)	22.23 (.875)	25.40 (1.000)	0.5 (.020)	28.575 (1 $\frac{1}{8}$ )	20 000	39 300
PHSB 12	286	19.050 (.7500)	-16UNF (.7500)	44.45 (1.750)	17.45 (.687)	22.23 (.875)	24.84 (.978)	95.25 (3.750)	7.92 (.312)	73.03 (2.875)	44.45 (1.750)	25.40 (1.000)	25.40 (1.000)	28.58 (1.125)	0.5 (.020)	33.338 (1 $\frac{3}{8}$ )	28 500	55 000
PHSB 16	998	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	11.07 (.436)	104.78 (4.125)	53.98 (2.125)	38.10 (1.500)	38.10 (1.500)	44.45 (1.750)	0.5 (.020)	47.625 (1 $\frac{7}{8}$ )	59 300	86 800

Note<sup>(1)</sup>  $r_{1s\min}$  stands for minimum allowable value of chamfer  $r$ .  
 Remark No grease is prepacked. Perform proper lubrication.

Inch series PILLOBALL Rod Ends **Insert Type/With Male Thread**

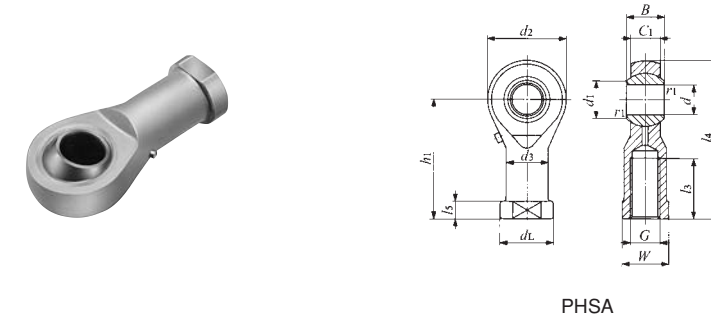


POSB

Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)											Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N
		$d$	Thread $S$ class 3A	$D$	$B$	$B_1$	$d_1$	$L$	$L_1$	$L_2$	$r_{smin}^{(1)}$	Ball dia. mm (inch)		
POSB 2	5.4	3.175 (.1250)	-32UNC (.1380)	11.91 (.469)	4.75 (.187)	6.35 (.250)	4.75 (.187)	29.77 (1.172)	23.80 (.937)	12.70 (.500)	0.3 (.012)	7.938 ( $\frac{5}{16}$ )	1850	2160
POSB 2.5	9.1	3.967 (.1562)	-32UNC (.1640)	14.27 (.562)	5.56 (.219)	7.14 (.281)	6.32 (.249)	35.71 (1.406)	28.58 (1.125)	15.88 (.625)	0.3 (.012)	9.525 ( $\frac{3}{8}$ )	2600	3370
POSB 3	14	4.826 (.1900)	-32UNF (.1900)	15.88 (.625)	6.35 (.250)	7.92 (.312)	7.77 (.306)	39.70 (1.563)	31.75 (1.250)	19.05 (.750)	0.3 (.012)	11.112 ( $\frac{7}{16}$ )	3460	4850
POSB 4	23	6.350 (.2500)	-28UNF (.2500)	19.05 (.750)	7.14 (.281)	9.53 (.375)	9.02 (.355)	49.20 (1.937)	39.67 (1.562)	25.40 (1.000)	0.5 (.020)	13.097 ( $\frac{33}{64}$ )	4590	8870
POSB 5	36	7.938 (.3125)	-24UNF (.3125)	22.23 (.875)	8.74 (.344)	11.10 (.437)	11.35 (.447)	58.72 (2.312)	47.63 (1.875)	31.75 (1.250)	0.5 (.020)	15.875 ( $\frac{5}{8}$ )	6800	14200
POSB 6	54	9.525 (.3750)	-24UNF (.3750)	25.40 (1.000)	10.31 (.406)	12.70 (.500)	13.13 (.517)	61.93 (2.438)	49.23 (1.938)	31.75 (1.250)	0.5 (.020)	18.256 ( $\frac{23}{32}$ )	9230	21600
POSB 7	77	11.112 (.4375)	-20UNF (.4375)	28.58 (1.125)	11.10 (.437)	14.27 (.562)	14.88 (.586)	68.28 (2.688)	53.98 (2.125)	34.93 (1.375)	0.5 (.020)	20.638 ( $\frac{13}{16}$ )	11200	26100
POSB 8	122	12.700 (.5000)	-20UNF (.5000)	33.32 (1.312)	12.70 (.500)	15.88 (.625)	17.73 (.698)	78.59 (3.094)	61.93 (2.438)	38.10 (1.500)	0.5 (.020)	23.812 ( $\frac{15}{16}$ )	14800	36200
POSB 10	186	15.875 (.6250)	-18UNF (.6250)	38.10 (1.500)	14.27 (.562)	19.05 (.750)	21.31 (.839)	85.73 (3.375)	66.68 (2.625)	41.28 (1.625)	0.5 (.020)	28.575 ( $1\frac{1}{8}$ )	20000	39300
POSB 12	295	19.050 (.7500)	-16UNF (.7500)	44.45 (1.750)	17.45 (.687)	22.23 (.875)	24.84 (.978)	95.25 (3.750)	73.03 (2.875)	44.45 (1.750)	0.5 (.020)	33.338 ( $1\frac{3}{16}$ )	28500	55000
POSB 16	1129	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	104.78 (4.125)	53.98 (2.125)	0.5 (.020)	47.625 ( $1\frac{7}{8}$ )	59300	112000

Note<sup>(1)</sup>  $r_{smin}$  stands for minimum allowable value of chamfer  $r$ .  
 Remark No grease is prepacked. Perform proper lubrication.

Lubrication Type PILLOBALL Rod Ends **Die-cast Type/With Female Thread**



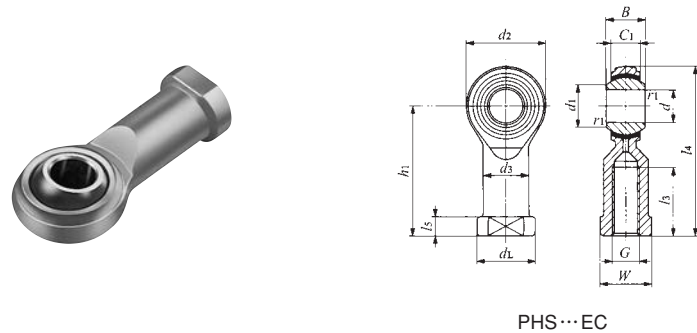
PHSA

Identification number	Mass (Ref.) g	Boundary dimensions mm																Static load capacity $C_s$ N
		$d$	Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_4$	$h_1$	$l_3$	$l_5$	$W$	$d_3$	$d_L$	$r_1^{(1)}$	Ball dia. mm (inch)		
PHSA 5	17	5	M 5×0.8	17	6	8	7.7	35.5	27	16	4	9	9	11	0.2	11.112 ( $\frac{7}{16}$ )	5470	
PHSA 6	25	6	M 6×1	19.5	6.75	9	9	39.7	30	16	5	11	10	13	0.2	12.700 ( $\frac{1}{2}$ )	6760	
PHSA 8	45	8	M 8×1.25	24	9	12	10.4	48	36	19	5	14	12.5	16	0.2	15.875 ( $\frac{5}{8}$ )	10200	
PHSA 10	70	10	M10×1.5	28	10.5	14	12.9	57	43	23	6.5	17	15	19	0.2	19.050 ( $\frac{3}{4}$ )	13100	
PHSA 12	105	12	M12×1.75	32	12	16	15.4	66	50	27	6.5	19	17.5	22	0.2	22.225 ( $\frac{7}{8}$ )	16400	
PHSA 14	155	14	M14×2	36	13.5	19	16.9	75	57	30	8	22	20	25	0.3	25.400 (1)	20000	
PHSA 16	190	16	M16×2	40	15	21	19.4	84	64	36	8	22	22	27	0.3	28.575 ( $1\frac{1}{8}$ )	23900	
PHSA 18	290	18	M18×1.5	45	16.5	23	21.9	93.5	71	40	10	27	25	31	0.3	31.750 ( $1\frac{1}{4}$ )	28800	
PHSA 20	400	20	M20×1.5	49	18	25	24.4	101.5	77	43	10	30	27.5	34	0.3	34.925 ( $1\frac{3}{8}$ )	33400	
PHSA 22	500	22	M22×1.5	54	20	28	25.8	111	84	47	12	32	30	37	0.3	38.100 ( $1\frac{1}{2}$ )	40400	

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$ .  
 Remarks1. A grease nipple is provided on the body.  
 2. No grease is prepacked. Perform proper lubrication.  
 3. When a metric fine thread specification for inner ring bore deameter  $d$  of 8 mm to 14 mm is required, please contact **IKO**.

**PILLOBALL**

Maintenance-free Type PILLOBALL Rod Ends **With Female Thread**

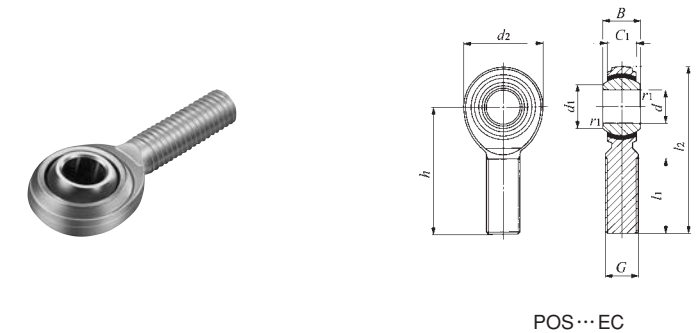


PHS...EC

Identification number	Mass (Ref.) g	Boundary dimensions mm														Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		$d$	Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_4$	$h_1$	$l_3$	$l_5$	$W$	$d_3$	$d_L$	$r_{1s \min}^{(1)}$			Ball dia. mm (inch)
<b>PHS 3EC</b>	5.7	3	M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 ( $\frac{3}{16}$ )	3 500	2 480
<b>PHS 4EC</b>	11.9	4	M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 ( $\frac{3}{8}$ )	4 950	3 260
<b>PHS 5EC</b>	16.5	5	M 5×0.8	16	6	8	7.7	35	27	12.5	4	9	9	11	0.2	11.112 ( $\frac{7}{16}$ )	6 540	4 010
<b>PHS 6EC</b>	25	6	M 6×1	18	6.75	9	9	39	30	13.5	5	11	10	13	0.2	12.700 ( $\frac{1}{2}$ )	8 410	4 940
<b>PHS 8EC</b>	43	8	M 8×1.25	22	9	12	10.4	47	36	16	5	14	12.5	16	0.2	15.875 ( $\frac{5}{8}$ )	14 000	7 760
<b>PHS 10EC</b>	72	10	M10×1.5	26	10.5	14	12.9	56	43	19.5	6.5	17	15	19	0.2	19.050 ( $\frac{3}{4}$ )	19 600	10 500
<b>PHS 12EC</b>	107	12	M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 ( $\frac{7}{8}$ )	26 200	13 700
<b>PHS 14EC</b>	160	14	M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	33 600	17 200
<b>PHS 16EC</b>	210	16	M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 ( $1\frac{1}{8}$ )	42 000	21 100
<b>PHS 18EC</b>	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 ( $1\frac{1}{4}$ )	51 400	25 100
<b>PHS 20EC</b>	380	20	M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 ( $1\frac{3}{8}$ )	61 600	30 000
<b>PHS 22EC</b>	490	22	M22×1.5	50	20	28	25.8	109	84	41	12	32	30	37	0.2	38.100 ( $1\frac{1}{2}$ )	74 700	36 400

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$   
 Remarks1. Neither oil hole nor grease nipple is provided.  
 2. When a metric fine thread specification for inner ring bore deameter  $d$  of 8 mm to 14 mm is required, please contact **IKO**.

Maintenance-free Type PILLOBALL Rod Ends **With Male Thread**



POS...EC

Identification number	Mass (Ref.) g	Boundary dimensions mm														Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N
		$d$	Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_2$	$h$	$l_1$	$r_{1s \min}^{(1)}$	Ball dia. mm (inch)					
<b>POS 3EC</b>	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 ( $\frac{3}{16}$ )	3 500	1 220			
<b>POS 4EC</b>	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 ( $\frac{3}{8}$ )	4 950	2 060			
<b>POS 5EC</b>	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 ( $\frac{7}{16}$ )	6 540	3 340			
<b>POS 6EC</b>	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 ( $\frac{1}{2}$ )	8 410	4 730			
<b>POS 8EC</b>	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 ( $\frac{5}{8}$ )	14 000	7 760			
<b>POS 10EC</b>	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 ( $\frac{3}{4}$ )	19 600	10 500			
<b>POS 12EC</b>	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 ( $\frac{7}{8}$ )	26 200	13 700			
<b>POS 14EC</b>	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 (1)	33 600	17 200			
<b>POS 16EC</b>	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 ( $1\frac{1}{8}$ )	42 000	21 100			
<b>POS 18EC</b>	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 ( $1\frac{1}{4}$ )	51 400	25 100			
<b>POS 20EC</b>	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 ( $1\frac{3}{8}$ )	61 600	30 000			
<b>POS 22EC</b>	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 ( $1\frac{1}{2}$ )	74 700	36 400			

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$   
 Remarks1. Neither oil hole nor grease nipple is provided.  
 2. When a metric fine thread specification for inner ring bore deameter  $d$  of 8 mm to 14 mm is required, please contact **IKO**.